

T₂₀ for ⁷Li Induced Transfer Breakup Reactions

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T₂₀ analyzing powers have been measured for the ¹²⁰Sn(⁷Li, ⁶Li* → α+d)¹²¹Sn and ¹²⁰Sn(⁷Li, ⁸Be → 2α)¹¹⁹In transfer breakup reactions at 70 MeV beam energy, where the ⁶Li* is in the 2.19 MeV 3⁺ excited state and the ⁸Be is in its ground state.

The transfer breakup reactions are of particular interest because they combine two processes which are now relatively well understood in isolation. However there has been little published on transfer breakup reactions. ⁷Li induced reactions are of relevance to studies of nuclei having cluster structures of a similar nature to that of ⁷Li. They are also of relevance to radioactive beam studies where the radioactive projectile nuclei have a large cross section for nucleon transfer and, in particular, fragmentation. Coupled channels (CC) calculations have been found to describe transfer reactions very well and more recently continuum discretized coupled channels (CDCC) calculations have been very successful in describing breakup reactions. The challenge is to thoroughly test these calculations with the more complex transfer breakup reactions.

The detector configuration used for the breakup fragments needs to be considered for the case of ⁶Li* where the L=2 breakup results in an anisotropic fragment distribution and a consequent phase space effect of detector positions. A technique has therefore been developed to take this into account. A phase space correction is applied to the CDCC calculations so that they may be reasonably compared with the measured T₂₀ data.

The results show that the calculations do well in reproducing T₂₀ analyzing power data in one of the first tests of CC and CDCC calculations for transfer breakup reactions.